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Twins Belie Fat-Calorie Connection

Identical twins who ate both high-fat and low-fat diets in a controlled study put a dent in the popular belief that dietary fat increases people's calorie intake. On average, the seven sets of male twins chose about the same number of calories when served a diet containing 20 percent fat calories and a diet containing 40 percent fat calories. The two diets had the same palatability, fiber content and calories per ounce —factors that may affect calorie intake. It now appears that the number of calories per ounce of food may be more important than fat content, supporting some earlier, short-term studies.

These findings may help explain why the U.S. population has added weight, although fat intake has dropped and low-fat and fat-free products have flooded the market. Many such products are calorically dense. The findings also suggest that genes exert some control over a person's preference for a high- or low-fat diet. Four sets of twins ate more calories from the high-fat menu. The other three pairs preferred the low-fat diet, indicating that genes may influence the tendency to overeat certain diets. The men metabolized both diets with equal efficiency.

The study, published in the *American Journal of Clinical Nutrition* (vol. 66, pp. 1332-1339), was funded jointly by ARS and the National Institutes of Health. A larger study involving 90 sets of identical twins is now in progress to determine to what extent people's genes contribute to body fat and overweight.

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Cut-Ups Stay Fresh Naturally

Sweet-smelling methyl jasmonate, a natural compound in all plants, protects produce from pathogens and doubles shelf life. Strawberries exposed to methyl jasmonate vapor for 24 hours at 68 degrees F resisted gray mold for 14 days with no change in fruit firmness. Gray mold, *Botrytis cinerea*, is a major fungal disease of harvested fruits and vegetables. Treatment of fresh-cut celery and green peppers eliminated browning and decreased bacterial growth a thousandfold for up to two weeks at 50 degrees F. The treatment also controlled soft rot on the peppers. Another plus: Methyl jasmonate slowed grey mold on grapes.

It is thought that the chemical elicits proteins in living plants and harvested produce that make them more resistant to temperature changes and attack by insects, bacteria and fungi. Most plants contain small amounts of jasmonates, but jasmine and honeysuckle contain high levels. Methyl jasmonate is available commercially and is inexpensive. Truckloads of produce can be treated with less than one ounce, which costs about $30. It acts within a couple of hours and leaves no residue.

In related research, the scientists mixed citric acid and N-acetylcysteine—a common, sulphur-containing amino acid—to keep banana slices for 14 days at 40 degrees F without browning. The treatment not only allows bananas to be marketed as fresh-cut, but also retards browning and reduces decay in fresh-cut slices of apple, pear, peach, plum, nectarine and avocado. Treated apples did particularly well, holding up for 50 days in cold storage without any change in flavor. Read more details on the World Wide Web at: http://www.ars.usda.gov/is/AR/archive/feb98/fres0298.htm

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Vegetarians Need Zinc-Rich Foods

Vegetarians who include milk and eggs in their diets can meet their zinc requirements by eating plenty of whole grains and legumes such as beans and peas, researchers have found. The researchers studied 21 women who consumed both a lacto-ovo vegetarian diet—one containing milk and

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eggs but no other animal products—and a typical U.S. diet for eight weeks each.

Among its many functions, zinc helps the body guard against infections and repair wounds. In the U.S., however, meat is the major source of zinc. It's important to know if the nearly 2 million U.S. lacto-ovo vegetarians may be depriving themselves of adequate zinc. It's particularly important since typical vegetarian diets contain 10 to 30 percent less zinc than non-vegetarian diets. They also contain a lot of fiber and phytate, which tend to reduce absorption of minerals such as zinc.

In the study, the vegetarian diet supplied 14 percent less zinc despite efforts to include high-zinc foods. And the women absorbed 21 percent less zinc from the vegetarian diet, putting their absorption deficit at 35 percent. However, they absorbed enough to replace what they excreted, and their health remained good. In fact, the two diets produced very little difference in balance measurements—absorption minus excretion—for zinc and several other minerals.

The women's iron status was also assessed, because the body absorbs iron much more readily from animal foods than from plant foods. The women absorbed 70 percent less iron while eating the vegetarian diet, but they showed no signs of iron-poor blood after eight weeks. Read more details on the World Wide Web at: http://www.ars.usda.gov/is/AR/archive/mar98/zinc0398.htm

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Folate RDA Looks Too Low for Women

Imagine eating triple-boiled green beans, carrots, chicken, turkey or ham at lunch or dinner for weeks in a row. Now be thankful you don't have to: 10 dedicated women, aged 49 to 63, already took the challenge—for the cause of science. They volunteered in a 12-week study that yielded new information about women's need for folate, an essential B vitamin. The findings add to other evidence that the Recommended Dietary Allowance of folate for women—180 micrograms (mcg) daily—may need to be increased.

Researchers monitored several folate-linked indicators of good health. These include DNA formation, white blood cell makeup, and regulation of the amino acid, homocysteine. Blood levels of homocysteine can accumulate to unhealthful levels in people who do not eat enough folate. All three indicators were compromised in the women after nine weeks of eating meals that provided only 30 to 60 percent of the RDA for folate. (Triple-boiling key foods knocked out about half of their folate.)

Even this mild folate deficiency hampered DNA formation. What's more, seven of the women exhibited more DNA damage, based on an increase in the number of micronuclei in their white blood cells. Excess DNA damage may increase risk of cancer and birth defects. Half of the women continued to have high blood levels of homocysteine two weeks after the low-folate diet ended, even though they were getting 1.6 times the folate RDA for those two weeks.

Orange juice, liver, eggs, dark-green leafy vegetables, peas and beans, and nuts and seeds are good sources of folate. The vitamin is especially important to women of child-bearing age. It helps prevent birth defects such as spina bifida. Makers of enriched bread, flour, cornmeal, rice, pasta and other grain products are required to fortify these foods with folate. Read more about the subject on the World Wide Web at: http://www.ars.usda.gov/is/AR/archive/mar98/fola0398.htm

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Dietary Needs of Nursing Teenage Moms

Special nutritional guidelines for teenage mothers who are nursing may be a good idea, according to preliminary research results. In a comparison of breast milk between 11 teen and 11 adult moms, the breast milk had similar nutrients. But teens produced 37 to 54 percent less milk. Over the long term, that would shortchange the teens on meeting their babies' nutritional needs. The results, published in the *Journal of Adolescent Health* (vol. 20, pp. 442-449), were statistically significant even after adjusting for differences in feeding time and nursing frequency.

The average age of the teen moms was 16. Researchers suspect that their lower milk production may be due to the fact that they have not yet completed their own growth. Since a teen mother has this additional nutrient demand, her body may "choose" to favor her and reduce milk production for her baby.

To test this thesis, the research team measured body composition, diet and milk production of 24 teenage mothers, half of whom breast-fed their babies. Eleven other teens who had never been pregnant were studied for comparison. Preliminary findings suggest that nursing teens continue to add muscle mass to their bodies, indicating continuing growth.

Teens who breast-fed appeared to consume 23 percent more calories and vitamin B_6, and 40 percent more protein. Their dietary needs returned to regular levels after they stopped breast-feeding. More details are on the World Wide Web at: http://www.ars.usda.gov/is/AR/archive/mar98/diet0398.htm

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Intestinal Parasite Found in Raw Oysters

A single-cell parasite, *Cryptosporidium parvum*, has for the first time been found in oysters. An ARS researcher and colleagues with Johns Hopkins University and the National Oceanic and Atmospheric Administration found *C. parvum* oocysts—encased eggs—in oysters taken from the mouths of six rivers feeding the Chesapeake Bay. Some of the oysters had 4,000 oocysts—many times the infective dose.

The researchers also demonstrated that oocysts could develop in mice. This indicates that they pose a potential risk to humans who eat raw oysters, although there have been no human outbreaks attributed to oysters. A report on the study is in *Applied and Environmental Microbiology* (vol. 64, pp. 1070-1074).

C. parvum are protozoan parasites found in waterways worldwide. When ingested, they can infect gastrointestinal cells, where they evoke cramping, diarrhea and sometimes nausea and vomiting four to 10 days later. Because of the long incubation period, *C. parvum* is often not connected with the flu-like symptoms. Symptoms range from mild to severe in healthy people and can lead to chronic diarrhea, dehydration and death in people who have a weak immune system.

The oocysts don't survive temperatures above 164 degrees Fahrenheit, so boiling or frying shellfish would prevent infection. But they do survive chlorine quite well. In 1993, more than 400,000 Milwaukee residents suffered *C. parvum* infections from contaminated drinking water. Smaller outbreaks have occurred around the country.

The parasite can infect all mammals. Feces from humans or domestic and wild mammals, including white tail deer, can potentially contaminate waterways. Geese can transport oocysts through their feces, the researchers found, and contribute to their spread into waterways.

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Symposium XXIII
Fresh Fruits and Vegetables—Quality and Food Safety

ARS is sponsoring a symposium May 3-6, 1998, on quality and safety of fresh fruits and vegetables at the Beltsville, Md., Agricultural Research Center. A significant part of the symposium will focus on measuring and evaluating quality of both whole and fresh-cut fruits and vegetables. Other topics include factors contributing to microbial pathogens in produce. For more information or registration, contact Kendra Jenkins, symposium secretary, (301) 504-6128, fax (301) 504-5107; kjenkins@asrr.arsusda.gov

Salmonella Pre-Empted From Poultry

A new ARS-developed product that reduces potential salmonella contamination in poultry is being marketed by MS Bioscience of Dundee, Ill. The product, called PRE-EMPT, prevents salmonella bacteria from taking hold in the intestines of newly hatched chicks. ARS researchers isolated 29 beneficial intestinal bacteria from older birds and blended them into a mixture that can be sprayed onto newly hatched chicks to give them the same level of natural protection against salmonella as older chickens have.

The U.S. Food and Drug Administration has approved this bacterial mixture based on field tests with 80,000 chickens in U.S. commercial chicken houses. It marks the first time FDA has approved a mixture of bacteria as a type of animal drug known as a "competitive exclusion product." ARS has patented the bacterial mixture, known originally as CF-3, and the method for producing it.

While PREEMPT can help poultry producers reduce the risk of salmonella transmission to people, it should be used as part of a comprehensive program of proper food handling and preparation measures designed to minimize the risk posed by all potential food borne pathogens. Chicken must still be properly handled and thoroughly cooked to be safe.

There are an estimated 2 million cases of salmonella poisoning each year. Of these, about 40,000 cases are culture-confirmed. Most exposure is from raw or undercooked meat, poultry, milk and eggs. The human health care bill for salmonellosis averages about $4 billion annually.

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Detector Spotlights Fecal Contamination

A new way to detect unseen fecal contamination on fresh meat could help industry meet new food safety regulations designed to control disease-causing bacteria. Feces are the major source of bacterial contamination in livestock and poultry slaughterhouses. ARS and Iowa State University researchers built a detector, using fluorescent spectroscopy, that illuminates unseen fecal contamination on meat. The device is adaptable to any size packing plant. When redesigned as a hand-held unit, similar to metal detectors used in airports, the instrument could alert meat packers to

fecal contamination within seconds. The contaminated carcass could then be sanitized before the contamination spreads.

Meat packers now visually inspect carcasses for fecal contamination. With the new technology, this job will be easier, faster and more accurate. The technology is timely because USDA's Food Safety and Inspection Service (FSIS) is enforcing a zero tolerance standard for fecal contamination on livestock and poultry carcasses. The researchers are patenting their technology, and discussions are under way with industry cooperators on possible commercial development.

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Curbing "Bird Flu" Before It Jumps to People

A new vaccine promises to suppress future outbreaks of the Hong Kong "bird flu"—H5N1. The flu jumped directly from chickens to humans, killing several Hong Kong residents by late 1997. Researchers with ARS and Protein Sciences Corporation of Meriden, Conn., originally developed a vaccine to protect against an avian influenza strain that appeared in Mexico in 1995. The Mexican strain is in the same genetic family as the Hong Kong virus, but gave no evidence of infecting people. Its relatedness, however, prompted the researchers to develop another similar vaccine against the Hong Kong strain late last year. The tests proved 100 percent effective in protecting birds.

Scientists in Hong Kong are now retesting the vaccine's efficacy on that side of the globe. In the United States, the H5 vaccines are being evaluated for approval in case of future outbreaks on this continent. An effective vaccine could reduce the likelihood of the virus' spread in poultry if it returns. The virus is 100 percent lethal in chickens.

To develop the vaccines, Protein Sciences Corporation combined its own patented technology with ARS insights on the virus' genetic makeup and ARS-supplied genetic material. The technology uses an insect virus, baculovirus, to produce huge quantities of a single viral protein.

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Healthier Foods Could Mean Tastier Foods

Mouth-watering, eye-pleasing fruit could be one payoff of research to increase the natural compounds in plant foods that appear to enhance health. Many of these compounds, called phytonutrients, are produced during the ripening process. The dilemma: how to allow fruit to ripen naturally on the tree or vine to get the maximum in phytonutrients while retarding the softening that occurs after the fruit is picked.

That's one research area suggested for exploration at ARS-sponsored workshops on food, phytonutrients and health in March. About 115 nutrition, health, plant and post-harvest scientists from ARS, universities and private industry met for three days to define research priorities and discuss the federal role. It will take such interdisciplinary research teams to ensure that the U.S. food supply provides optimum nutrition.

News about potential benefits of broccoli, garlic, tea, soybeans and tomatoes has raised public awareness and increased research on phytonutrients. The U.S. may be on the threshold of the next agricultural revolution—not more products, richer ones. But scientists worry that the publicity for phytonutrients is far ahead of the science.

Among the most pressing needs mentioned: Nutrition and health scientists need to decide which phytonutrients are most promising before plant scientists invest time and money in enriching crops or in identifying the cultivation, harvesting, handling and storage practices that conserve phytonutrients. Nutrition and health scientists are blocked in identifying the important phytonutrients by a lack of sensitive assays to indicate small changes in risk for cardiovascular disease, cancer or other maladies. And all said they need accurate analytical methods for detecting phytonutrients.

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